Land Use Policy 90 (2020) 104254

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Knowledge flows: Farmers' social relations and knowledge sharing practices in 'Catchment Sensitive Farming'

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ARTICLE INFO

Keywords:
Good farmer
Farming
Knowledge
Knowledge practices
Knowledge cultures
Farming knowledge
Rivers
Riparian environments
Bourdieu
Farming cooperation
Agri-environmental
Catchment Sensitive farming
Flooding

ABSTRACT

The move towards sustainable agriculture requires a more detailed understanding of farmers' knowledge(s) and knowledge practices. Increasingly, it is important to understand not only what farmers understand, but how their knowledge practices incorporate others – especially given the emerging call for environmentally-orientated policy measures to move beyond an individual farmer focus. This paper considers how farmers engage with, utilise and share knowledge through a focus on the Catchment Sensitive Farming (CSF) initiative in the UK. In exploring the importance of social contexts and social relations to these practices, the paper brings together understandings of knowledge with those from the literature on good farming to consider how different knowledges gain credibility, salience and legitimacy in different contexts. Drawing on qualitative semi-structured interviews with farmers in a 'priority catchment' in the North of England, the paper notes a general receptiveness to the knowledge offered by CSF advisors, but highlights the importance of specific contexts and personal relationships within this process and how farmers may hold different knowledge practices in relation to different parts of their farm. Specific places and spatial contexts are important to how knowledge is taken on and reworked and changing regulations and environmental conditions, the paper suggests, may be reshaping what knowledges farmers draw on and trust.

1. Introduction

Better understanding farmers' knowledge(s) and learning processes is a central goal in the move towards more sustainable agricultural practices. Accordingly, there is now a growing body of social science research which seeks to uncover the nature and complexities of farmers' knowledge – both relating to how they understand their farm environments as well as the potential knowledge conflicts that may arise when farmers come into contact with other, conservation-focused, environmental knowledges (Reed et al., 2010; Riley, 2008). Recent attention has moved beyond a focus on individual farmer knowledge toward a call to understand more collective forms of environmental management and farmer-to-farmer knowledge relations. This research agenda has been given fresh impetus through the recent review of the Common Agricultural Policy (CAP), which has emphasised the need for more collective modes of working which "encourage farmers to deliver a significant enhancement of the quality of the environment at a larger scale and in a measurable way" (European Commission, 2018, p. 78). This suggestion comes out of a realisation that the founding premise of individual, farm-level, agri-environmental measures may be insufficient to achieve their environmental objectives – both because many habitats and features of environmental value may span ownership boundaries and also, particularly relating to riparian environments, the actions of one land manager within a catchment may impact upon those within another part (Lawton et al., 2010; McKenzie et al., 2013).

In progressing our understandings of more 'joined-up' approaches, there have been reviews of the current landscape-scale environmental scheme options open to farmers (Franks, 2019), hypothetical considerations of what future attempts at collaborative management may look like (Franks and Emery, 2013), and a consideration of what barriers farming histories and pre-existing farmer relations may play in impeding the facilitation of these developments (Riley et al., 2018). Whilst such studies have recognised the importance of fostering more landscape-scale interaction between farmers and the need to encourage farmers to learn from, and take into consideration, the knowledge of other farmers in their region, there is relatively little empirical research on how such attempts may play out in practice – with Stock et al. (2014, p. 412) noting the pressing need to pay "greater attention to the micro/macro relationships between actors at and across different scales". Drawing on in-depth interviews with farmers involved in the Catchment Sensitive Farming (CSF) initiative in the UK - a government-led initiative focusing on 'priority catchments' which utilises catchment

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https://doi.org/10.1016/j.landusepol.2019.104254
Received 16 May 2019; Received in revised form 15 August 2019; Accepted 27 September 2019
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steering groups and designated 'catchment sensitive farming officers (CSFOs)' in an attempt to enable farmers to improve water quality and health on their farms[1] - the following seeks to be one of the first to attend to this current gap in our understanding. Running since 2006, CSF is part of the national response to meet the requirements of the Water Framework Directive (WFD) and is currently in its fourth phase (which runs until 2021).[2] The initiative aims to raise awareness of river and water health, with a specific focus on reducing pollution, and had an overarching focus on long term behavioural change with interested farmers and participation is voluntary. To fulfil these aims, CSF offers farmers free advice and access to grants for infrastructure[3] that will benefit water quality (for example, yard works for clean and dirty water separation). The grants were up to £10,000 per holding paying 50% of the costs of the implemented infrastructure. This paper considers, if and how, these farmers engage with, utilise and share knowledge within this initiative and examines the importance of social relations and social contexts to this.

In reviewing the broad literature on the interface between scientific and other forms of understanding relating to the environment, Raymond et al. (2010, p. 1769) caution that the past tendency to use simplistic, and often dualistic, terms for different types of knowledge (expert-lay; local-scientific etc) "does not sufficiently take into account the way individuals learn, make sense of new information, or the social contexts that influence how people understand something" – and two aspects of this assertion are important for the context of this paper. First, although there is a large body of work which has noted the potential value of environmental knowledge which may arise from farmers' direct, experiential, engagement with particular environments (Berkes, 2012), there is an emerging literature which has noted that farmers have, often for many years, engaged with and integrated, more codified and scientific understandings into their practices - especially in the name of production (Burton and Riley, 2018). Second, and interrelated, there is a realisation that knowledge and knowledge practices are "thoroughly social" (Tsouvalis et al., 2000, p. 912). As such, there is a recognition that farmers' social relations are crucial to their knowledge development, contestation and sharing. In paying attention to these social relations and social contexts, the following paper explores three hitherto under-considered areas. First, whilst there have been some studies which have considered farmers' knowledge interactions within more structured environments aimed at 'social learning' – such as in farmer field schools (Guo et al., 2015)– the paper reflects on their many everyday, more informal and ad hoc interactions which may remain undocumented. Second, and interrelated, the paper moves beyond the tendency in previous studies to focus on the individual (usually principal farmers) in examining issues of farmer (and farmer-to-farmer) knowledge, considering how other actors on farms (workers, partners and family members for example) may play a role in these processes. Third, the paper calls for a closer recognition of the temporal dynamicity of farmers' knowledge interactions – noting that their interactions with other farmers, as well as environmental advisors and officials, often have a long history that (re)shapes the nature of current knowledge practices. In examining these issues, the paper draws together the literature on farming knowledge(s) with notions of the 'good farmer' – which offers a useful lens for understanding how farmers' social interactions may be shaped by farmers' adherence to locally-recognised practices, symbols and performances of 'good farming' and a recognition that these networks are only as good as the social relations which make them (Fisher, 2013; Sutherland and Burton, 2011). Following a discussion of this conceptual framing, the paper outlines the case study and methodological approach drawn on in the research before exploring the knowledge interactions between farmers and other actors and the importance of spatial and social contexts to this.

2. Background

The literature relating to farming knowledge(s) has grown significantly within the last few decades, with a prominent focus being on the epistemological differences and similarities between farmer and scientist understandings of the farming environment (and specific farming practices) and how these might come together in the discussion of farm production activities (Burton, 2004), new technologies (Tsouvalis et al., 2000, p. 912) and farmland conservation (Riley, 2016). Whilst early research noted the differences in, and common incompatibility between, ways of knowing observed between farmers and conservation scientists (Burgess et al., 2000), more recent work has pointed to the evident similarities between the two and offer examples of where constructive dialogues might take place (Ingram et al., 2016). Various classifications of knowledge have been put forward and are useful to the exploration of knowledge practices within farming. Lundvall and Johnson (1994) distinguish between four types of knowledge: 'know-what' (empirical knowledge of facts), 'know-why' (knowledge of scientific principles and theories), 'know-how' (practical skills of doing things) and 'know-who' (an understanding of the knowledge community and who to access for 'know how'). Although classified separately, each knowledge type may interact with each other and work together.

The shaping of farmers' knowledge is a complex and multi-stranded process which, in part, is closely linked to place (Wojcik et al., 2019). This tacit, local form of knowledge develops within context and the specific features of an area, informed by various sources and shaped by the culture and economy of the area. The importance of place is fundamental to understanding knowledge production and sharing – providing social settings and sites in which new information is exchange in the development of knowledge. As Agnew and Livingstone (2011, p. 328) highlight: "knowledge creation and circulation are invariably situated somewhere […] Beyond mere location in space, therefore, from this perspective places really matter for what we think abstractly as well as what we do practically". Wojcik et al. (2019) acknowledge this, discussing the importance of space for knowledge development, noting how farmers "grow in" to the space of an area, resulting in a sum of knowledge that arises out of many years of collaboration between a person and space, and the subsequent socialisation and experiences of living in that space.

In developing a less dualistic framework for understanding knowledge, Raymond et al. (2010) consider how knowledge may be placed on different continuums: 1) that which is local or context-specific; 2) the extent to which the knowledge is formalised; 3) whether it demonstrates expertise; 4) whether the knowledge is articulated in ways that can be accessed by others (i.e. whether it is more *tacit* (more subjective unarticulated and personal) or *explicit* (documented, public and structured) (see (Wojcik et al., 2019)); and 5) whether it is embedded within cultural rules or norms and in dialogue with ecological conditions in a particular context. In light of this framework, Raymond et al. (2010) suggest that 'local knowledge' may refer to lay, tacit and personal knowledge – but may include expert understandings; 'scientific knowledge' may include that derived through more scientific methods with a focus on validity and reliability (perhaps from natural or social

[1] https://www.gov.uk/guidance/catchment-sensitive-farming-reduce-agricultural-water-pollution. For a detailed report that describes the purpose and activities of CSF covering Phase 3 of the project from April 2011 to March 2014 see http://publications.naturalengland.org.uk/publication/6312755155959808. For the complementary detailed evaluation report see http://publications.naturalengland.org.uk/publication/6510716011937792.

[2] The Water Framework Directive is a UK initiative which seeks to provide an overarching framework for the protection and improvement of inland surface waters, ground waters, estuaries and coastal waters. For comprehensive details of the context and deliver of WFD see: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/307788/river-basin-planning-standards.pdf.

[3] Following the CAP reform in 2014, these grants were merged into Countryside Stewardship Grants falling under Water Capital Grants.

science research); whilst 'hybrid knowledge' is the new understandings that may emerge from an integration of these knowledge sources.

In those empirical studies seeking to move beyond a focus on individual farmers' knowledge, advisors have been seen as important in providing specialist support and policy advice (Ingram, 2008) and as facilitators amongst farmers' groups where there might be a reluctance to share knowledge where it is thought to have/offer a competitive advantage (Garforth et al., 2003). Critiquing the previously-popular linear view of advisor-to-farmer knowledge transmission – where advisors are seen as experts and farmers as more passive recipients of knowledge – recent work has noted the importance of the associated social relations between farmers and advisors, has considered how advisors need to understand the social context of the farm, and how productive dialogue may take place as the 'know-what' and 'know-why' of farmers is combined with the 'know-who' and 'know-why' of advisors (Ingram and Morris, 2007). Those focusing on farmer-to-farmer knowledge relations have highlighted how pre-existing groups and collectives (such as clubs or auction markets) may get replaced by more topic-specific coalitions in relation to environmental management (Curry et al., 2012) and how facing risk may lead to greater levels of new knowledge seeking and sharing (Sligo and Massey, 2007). Although there have been examples, such as in the discussion of tillage, where farmers may experiment on their farms and share knowledge with neighbours, there is a suggestion that this is not universal (Ingram, 2010). Indeed, others have noted that knowledge-sharing practices relating to production may differ quite markedly from those relating to conservation (Riley et al., 2018).

Crucial to understanding how such integration of knowledge may occur, and how different knowledge(s) may be developed and valued, is understanding the importance of social context and social relations. In seeking to frame these social relations, we utilise Bourdieu's (1977, 1986) understandings of capital, habitus and field and, specifically, their application to the concepts of the 'good farmer' and 'good farming' (Burton, 2004). Bourdieu considers how capital development and exchange is central to an individual's positioning relative to others within the field and can help us to understand the social underpinning to farming knowledge(s). Bourdieu notes that capital exists in forms other than just economic capital (material goods) and calls attention to social capital (derived from, and reaffirmed by, social contacts) and cultural capital (skills, knowledge and dispositions as developed through processes of socialisation and education). Linking to these is symbolic capital which is the recognition – or "prestige and renown" (Bourdieu, 1977, p. 179) – that an individual enjoys by virtue of having these capitals when they are seen as legitimate within the 'rules of the game' of a particular field. As such, symbolic capital is important in defining what forms of capital, as well as how they are applied, are seen as legitimate within particular contexts, such as the case of farming considered here. The concept of habitus – what Bourdieu sees as the "system of lasting and transposable dispositions which, integrating past experiences, function at every moment as a matrix of perceptions, appreciations and actions" (Bourdieu, 1986, p. 82) – is central here, as acting in accordance with the habitus is central for group membership as it "provides each of its members with the backing of collectively-owned capital" (Bourdieu, 1986, p. 51).

Bourdieusian thinking has been taken forward in the literature on good farming, which observes how a farmer's status may be assessed on how they exhibit capital, specifically cultural capital, in one of its three forms: institutional (cultural competence certified through official institutions), objectified (symbols of prestige within a network which might include crop yields or high-status agricultural machinery), or embodied ("dispositions of the mind and body" (Bourdieu, 1986, p. 47)) – that is, skills which might include motoric, mechanical and managerial (Burton et al., 2008)). Exhibiting this capital, Burton et al. (2008) suggest, requires three conditions: 1) a skilled performance that differentiates between 'good' and 'bad' practice; 2) a clear, outward, sign that the skill has been performed; 3) that these signs are (visually) accessible to others. In their consideration of farming cooperation, Riley et al. (2018) note that although Bourdieu does not explicitly refer to trust within his discussion of capital, it is clear within his reference to how: "the reproduction of social capital presupposes an unceasing effort of sociability, a continuous series of exchanges in which recognition is endlessly affirmed and reaffirmed" (Bourdieu, 1986, p. 52) – where trust is, as Fisher (2013) concurs, a catalyst for social capital and relationships become translated into social capital where trust is present. Zucker (1986) refers to three modes of trust: 'institutionally-based trust' (coming from formal, institutionalised, settings), 'characteristic-based' trust (a product of group membership and social similarity of joint identity) and 'process-based trust' (more person-specific trust based on recurring exchanges between individuals). Lewicki et al. (1998) note that such trust may vary over time – not only being accumulated in a linear fashion, but varying in depth and strength across the different contexts and spaces of these relationships – a theme also picked up on by Fisher (2013) who argues that three factors are important to helping trust develop: longevity, consistency and regularity of contact.

Trust and capital are thus important to knowledge sharing, with observations showing that farmers are more likely to utilise knowledge when it comes from a trusted source (Fisher, 2013) which, as Riley et al. (2018) note, is associated with the capital status of farmers and how easy it is for other farmers to observe this status. Albeit using slightly differing terminology, Tsouvalis et al. (2000) and Riley (2008) note similar themes in their discussion of 'knowledge cultures' – a term they use to consider how knowledge is a relational achievement within which different groups may compete and align when articulating the social meaning of things. Knowledge cultures thus pay attention to the ways that discourse is structured and how knowledge is ascribed legitimacy. Like the literature on the good farmer, this work pays attention to the "rules of the game" (Bourdieu, 1977) – and, specifically, notes that such rules may be challenged by members of the group or outsiders. In applying such a framing to farmer-conservationist discussions, Morris (2006) considers the agri-environment-scheme policy knowledge culture which is framed by expert knowledge associated with environmental and conservation agencies and DEFRA – which draws on scientific and codified ways of understanding nature on farms. Farmers' knowledge-cultures tend, by contrast, to put emphasis on their place-specific, experiential understandings but have often been influenced by scientific understandings in the past (Morris, 2006; Riley, 2008). Morris (2006) goes on to reflect on the porosity of any supposed 'boundary' between such knowledge-cultures – showing how there has been, albeit tentatively, a co-constructing of what is seen as legitimate (see also Ingram and Morris, 2007). In thinking through the discussion of how this knowledge may be valued and taken on, Ingram et al (2016), following Cash et al. (2003), outline three aspects which are important: credibility, salience and legitimacy. *Credibility* refers to whether such information is considered to be accurate, valid and of high quality. For science, this credibility is derived through ideas of rigour in light of its rationalist and systematic derivation and, as such, credibility can be increased through reducing perceived uncertainty, or at least being transparent about this uncertainty (Steingröver et al., 2010). Social science research with farmers has noted that such credibility may be challenged by farmers when they hold observations to the contrary or where there is seen to be conflicting evidence (Wynne, 1996). Moreover, such assessments of credibility are often viewed through a broader contextual lens, with trust and social capital seen to play central roles. *Salience* refers to how relevant particular information is to a particular decision maker. Actors have different knowledge interests and hence different criteria for assessing the relevance of knowledge – relating to timing, context and need (Ingram et al., 2016). *Legitimacy* highlights "the extent to which knowledge production has been respectful of the divergent values and beliefs of stakeholders, unbiased in its conduct and fair in its treatment of opposing views and interests" (Ingram et al., 2016, p.118) – that is, a model that involves empowerment and inclusion of individuals. It has been noted that these

factors (co)evolve over time and that change in one measure might impact on another.

3. Methodology

The research reported upon here comes from a study in the North-West of England (UK), which sought to explore farmers' knowledge and understandings of riparian environments on their farms and what management practices (both voluntary or involuntary) they and/or other farmers were adopting in relation to water (this includes flooding, water quality improvements, reducing pollution, and indirect management – for example fencing off rivers). The research was based in a catchment with mainly upland characteristics, resulting in predominately pastoral farming, which has shaped much of the landscape. A total of 42 farms participated, representing the range of farm types in the area (6 dairy and sheep farms; 7 beef and sheep farms; 15 sheep farms; 11 dairy farms; 3 dairy, beef and sheep farms). In terms of their pre-existing knowledge, 7 of the 42 principal farmers interviewed had some form of formal agricultural training – be it through college courses or higher education. Of the sample, 11 reported that they had been on topic-specific training events organised by groups such as the National Farmers Union on issues such as dipping sheep, agri-environmental schemes (when they were first introduced) and soil compaction, but only 3 noted that they had, prior to their CSF involvement, been to 'open farm' events. Of the sample, over three quarters can be classified as family farms – with family labour making up the predominant labour forces. As will be discussed in the following sections, most of the holdings could be considered as self-contained – with little evidence of the share-farming or buying cooperatives noted in other parts of Europe. In locating farmers for interview, initial contact was made with the local Rivers Trust to gain access to the first wave of respondents and chain-referral sampling (Heckathorn, 2002) was used to locate subsequent respondents. At the time of interviewing, the catchment was designated a priority area within the CSF programme – catchments which were deemed at risk of agricultural diffuse pollution[4] (sediment, nitrogen, phosphorus). Advice offered through this programme was geared towards water management and includes information on suitable manure management, nutrient management, soil health, farm infrastructure, farm waste products and cross-compliance.[5] Various mechanisms are drawn upon to disseminate information, with most being group-focused – including workshops, demonstrations, farm walks and farm events. Access to such advice and information had meant some farms[6] had taken action to advance river health including tree planting alongside watercourses, water course fencing and installing dirty water handling facilities.

As the focus was on knowledge development and sharing, interviews took place on the farm to open up the possibility of having more than one participant (usually a farm worker or a farmer's partner) present for the interview (20 of the farm interviews had more than one respondent) (see Thomas et al. (2019a) for a fuller reflection on the methodological issues of interviewing farmers about rivers and riparian environments). A semi-structured interview approach was adopted to allow unforeseen areas of discussion to be explored and the addition of participants other than the main farmer. Discussion of knowledge was noted prior to interviewing as a topic for exploration, however in most instances it arose through wider questioning of farm management in relation to water and farming in a CSF priority catchment. Interviews lasted between 1 and 4 ½ hours, and where possible, took a walking interview approach (after Riley, 2010) which helped to gain access to details on specific environments or conservation-related features which had been implemented as part of CSF. Interviews were recorded using a handheld voice-recorder, transcribed verbatim and the transcripts were coded manually following the framework laid out by Jackson (2001). Several overarching themes were identified using this thematic coding and are discussed in the following sections.

4. Knowing the field – farmer-advisor relations

A common starting point, when farmers were asked about knowledge and CSF within interviews, was that offered by CSF advisors. Previous research has noted that farmer-advisor relations are a crucial nexus of knowledge exchange (Ingram and Morris, 2007), with some noting that rather than being solely a relationship of potential conflict, the farmer-advisor relationship may be one of productive dialogue (Morris, 2006). The following extracts offer insights into the nature of this relationship and its productive elements:

> "Farming is a right mix of everything so at the end of the day although sometimes we might think it, we don't know everything and ultimately these [advisors] are handy just to get another opinion or just vet something out." (Farmer 20)
>
> "Well that's why I joined the [discussion group]..To keep the water clear […] and do my bit but I don't know much more about the water…" (Farmer 35)
>
> "Yeah I suppose if it was a bigger river, I probably wouldn't see it the same, as it isn't so "manageable", but with this small beck I suppose I don't really need to know much about it" (Farmer 21)
>
> "[Advisor] was great, she went through it all and said what would be good and what wouldn't for us, our system. I haven't got the time to faff around with all the information, she gave me the main bits and I got to grips with those and took those on board" (Farmer 29)

The extracts reflect a general openness – even amongst those who did not change their practices as a result of participation in CSF activities – to listen to the knowledge offered by advisors and, in turn, exemplify two emerging findings relating to farmers' understandings. First, that farmers' knowledge may vary in relation to different aspects of their farm and second the very particular ways that farmers may utilise the knowledge given by advisors. The references of farmer 35 and farmer 21 to 'not know[ing] much' about rivers on their farm is in clear contradistinction to previous studies' observations of the detailed and temporally-layered understandings farmers have of particular terrestrial habitats on their farms (see for example Morris (2010)). As Thomas et al (2019b) note, farmers have a much greater level of everyday interaction with terrestrial areas of their farms as a result of their longstanding role within farm production and hence farming livelihoods. Rivers and riparian environments, by contrast, commonly constitute a 'non-productive' habitat in the eyes of farmers, often playing only subsidiary roles in production (such as a water source for cattle or as part of past land drainage systems). As such, farmers demonstrated less detailed know-how in relation to these environments and highlighted that they play a more marginal role in elevating their status as a 'good farmer' – standing less as objectified cultural capital or demonstrations of embodied cultural capital (skill) as might be noted for the appearance of crops and the condition of farm land (Burton, 2004). Added to this, the interview extracts illustrate that the recent regulatory changes – including the 'farming rules for water' which came into effect in the UK in April 2018[7] – revealed a level of uncertainty amongst farmers. This lack of know-why in relation to current

[4] These were determined by combining the Environment Agency's and English Nature's risk assessment on diffuse agricultural pollution to identify priority catchments.

[5] Cross-compliance is the requirement of minimum thresholds of management associated with public, animal and plant health; environment, climate change and good agricultural condition of land; and animal welfare.

[6] Of the 42 farms visited 35 farms had reported undertaking some level of work associated with CSF.

[7] https://www.gov.uk/government/publications/farming-rules-for-water-in-england.

regulations, when placed alongside the historical lack of continuous engagement (know-how) with rivers, meant that the understandings of CSF advisors had an increased salience to farmers and were openly listened to.

Rather than being a blanket acceptance of CSF advisors' knowledge, the extracts from farmer 20 and farmer 29 illustrate how advisor input forms part of the knowledge practices of farmers in relation to rivers and riparian environments and also highlight the work advisors do in order to position their knowledge as legitimate. Farmer 29, similar to several interviewed, highlighted what can be seen as a filtering process, whereby farmers relied on advisors to 'vet something out', or filter what knowledge was appropriate to their particular context. Crucial to this filtering process was the ability of advisors to articulate, to farmers, an understanding of the specific contexts in which the knowledge would be operationalised. This contextualisation related both to the knowledge of the specific region (and catchment) in which the farm was situated as well as the relevance of CSF to the specific farm itself. Such observations of contextual filtering are important for our wider understanding of knowledge dynamics and farmer-advisor relations. First, they illustrate how an appreciation of farmers' specific context can greatly enhance the credibility and legitimacy of advisors' understandings. Studies of farmer-advisor knowledge conflicts, particularly relating to agri-environmental measures, have arisen when more generic scheme prescriptions are applied to contexts which farmers feel are less appropriate, or what Clark and Murdoch (1997, p. 41) refer to as "travel [ling] very effectively into a whole range of differing locales". As authors such as Clark and Murdoch (1997) suggest, scientific expertise and agricultural extension work requires the field to be 'prepared' in advance – that is, in order to stop science 'stammering' (after Latour, 1999) as it enters the spaces of imprecision and uncontrollable variables of the field, conservation scientists often attempt to "modify the local environment in line with scientific prescriptions" (Clark and Murdoch, 1997, p. 57). By contrast, what we have observed is a process of advisors tailoring knowledge to fit the particular contexts of the field. This can be seen as part of what Raymond et al. (2010) refer to as articulating knowledge so that it is accessible to others – illustrating what general regulations mean for the specific practices on their farm and how current funding support may impact on farmers' practices. Rather, though, than this being about reducing the level of technical language or jargon *per se*, this process was about a *geographical* articulation, with advisors helping to translate scientific knowledge into a contextualised and cognisable form.

Whilst there was a general willingness by farmers to initially listen to CSF advisors, attend events and utilise their understandings in filtering the most appropriate knowledge to their contexts, the interviews also revealed how productive relationships developed over time between farmers and advisors. Echoing the observations of Schneider et al. (2009) – who show how a lack of trust between actors can impede knowledge sharing and co-development – the following extracts refer to the case of a specific advisor and illustrate how these relationships might proceed:

> "I mean, [an advisor], the farmer's daughter she's very, you know, she's very theoretical about it and she enjoys meeting farmers and has taken her time to get to know us you know, knows our point of view, she's definitely one you can entrust with your business. (Farmer 2)
>
> "He's [environmental officer] only learnt it from a textbook, not proper learning, not practical knowledge, not 50 years of making mistakes and fixing them, whereas [trusted advisor] she's got both, well not quite 50 years but 30'll do so we'll let her off and yeah she probably does know better than me sometimes" (Farmer 32)

The statements of Farmers 2 and 32 note that knowledge which is born out of direct experience is given greater credibility than that born out of more decontextualized and abstracted 'book knowledge', or what Bruckmeier and Tovey (2009, p. 268) refer to as knowledge which is "pruned of its contextual references". Beyond the aforementioned recognition of specificities of the geographical context, the examples also illustrate how their farming biography affords the advisor a level of capital and trust which, in turn, enhances the credibility and salience of the knowledge they offer. Their knowledge is what might be thought of as *geographically* salient in being developed in a familiar context through practical experience of farming. Significant to our broader understanding of farmer-advisor knowledge relations is that advisors, like farmers, have the potential to develop their own forms of social capital and trust and the interviews revealed that this happened in two main ways. First, and illustrated in the extract of farmer 2, is that the advisor's farming biography both affords them a level of community-based trust and also a demonstration of valued embodied cultural capital in terms of a broader understanding of agricultural practices and management. Second, interaction through the CSF events and individual farm visits meant that more processed-based trust was developed. Important to note is that these two forms of trust intersect in how farmers interact with advisor knowledge, with the community-based trust facilitating more rapid development of interpersonal trust. Farmer 2 and farmer 32 for example, illustrate how the 'theoretical' knowledge that they are sceptical of in the case of one advisor (cf. Wynne, 1996), becomes entrusted for the second advisor when it is interlaced with the capital they demonstrate in being local to the area and having a familiarity with farming.

5. Placing farmers' interactions

As Tregear and Cooper (2016) have noted, social interaction can be a crucial element of knowledge and learning, and for CSF is a central rationale in bringing farmers together. An emerging finding from the interviews was that spaces of interaction are important to this process, with two contexts proving significant – the CSF discussion groups (and farm walks) and the farm itself. Farmer 21 reflected on the role of discussion groups:

> "I'd never really met him [a nearby farmer] before the meetings but now we get on and chat on a regular basis, discuss the things raised in the meeting– without the meetings we probably would know of each other but never really talk" (Farmer 21).

For this farmer, the group meeting served a structural function of providing a space – both materially and cognitively – to meet another farmer in the area with whom he had no previous engagement. For others, the meetings provided not simply a place for introduction, but a space for what may be seen as a *re-engagement* with farmers with whom they already have an association. Important to explaining this re-engagement was the discussion of relationships with other farmers. Echoing the observations of Riley et al (2018), the interviews revealed that many farming practices have become increasingly individualized,[8] and whilst friendly and convivial relations are seen between farmers, these are often sporadic and relatively superficial engagements, with 'good farming' being seen as demonstrating autonomy and avoiding over-reliance on others. That is, whilst other farmers and neighbours may be drawn on in times of emergency, there is a strong level of expectation that farmers will be "self-sufficient" (farmer 10) and "not relying on others too much" (farmer 20) for their day-to-day activities. As a result, although there was often clear evidence of farmers making observations of neighbours' activities in general – what Burton (2004) has referred to as 'hedgerow farming' – most farmers reported having relatively little knowledge of their neighbours' specific land management activities. Accordingly, the group meetings provided a useful

[8] Particularly associated with structural changes to agriculture such as individual farm subsidy payments made to farmers in the UK under the Basic Payments Scheme. For more information see https://www.gov.uk/government/collections/basic-payment-scheme).

forum of common purpose for these farmers. In the case of farmer 21, this involved introductions to a farmer with whom he previously had no contact, whilst for others this was a chance to open more specific dialogue with farmers they already knew. Building on the earlier point that farmers have different knowledge practices in relation to the different areas across their farm, the interview discussions of CSF meetings highlighted a general openness to share information, about rivers and riparian environments, with other farmers. Whilst previous studies have observed farmers' unwillingness to share information outside the farm, and have attributed this to its perceived competitive value (Garforth et al., 2003; Ingram, 2008, 2010), the interviews highlighted a readiness to share and co-develop knowledge in relation to riparian environments. This comparative willingness to share information was seen to relate both to the peculiar nature of these environments and also to where previous knowledge on these environments originated from. Whilst knowledge associated with production is seen as 'hard earned' (Ingram, 2010) (often developed through years of trial and error on their farm) and a clear expression of cultural capital - and hence something farmers were less likely to share - it was found that the same association was not made with riparian environments on their farms. Moreover, much of the information that farmers did hold in relation to issues such as flooding and river health (and regulations associated with these) had been passed to them from off-farm sources (including CSF advisors), rather than developed from their own, direct, experience. Together, these factors meant that this knowledge was something that was not seen as competitive. As it was knowledge that had been passed to them in recent history, rather than something they had personally developed over many years, and was not readily turned into economic capital (c.f. knowledge on how to increase crop yields or the value of livestock (Burton et al., 2008)), it was knowledge that they deemed appropriate to discuss collectively and, where appropriate, share with other farmers. Underpinning this sharing is the value of CSF activities in providing a space for a move from characteristic-based trust to process-based trust – or from 'thick' to 'thin' trust (Putnam, 2001). Whilst farmers held thin, characteristic-based, trust of other farmers – as a result of them being part of a more abstracted 'farming community' or being based on their reputation (symbolic capital) – the meetings allowed thicker, process-based trust to develop as they talked through ideas on the farm. Such trust, the interviews revealed, was in part aided by their geographical location and their status as 'off-farm':

> "It was an interesting meeting that, it just made you think, nothing strenuous or intimidating just thinking and going through what we do and just picking up stuff we could improve and knock a view ideas about" (Farmer 8)

For respondents such as farmer 8, and echoing the wider interviews, this being off their own farm and in a group situation meant that CSF meetings were non-'intimidating' spaces. The good farmer literature highlights how the farm can be seen as portrait of the farmer themselves, standing as both objectified cultural capital in itself and also as the material embodiment of their farming skill (cultural capital) (Riley, 2010). As such, the farm represents not only their farming successes, but also their failures (cf. Wojcik et al., 2019). Farmers reported that on-farm visits, such as those that several had experienced in entering into agri-environment schemes, could accordingly be intimidating as farmers felt a need to justify not only their own current practices, but their predecessors' past ones "warts and all" (farmer 12). Such knowledge was thus not only local knowledge, but *personalised* knowledge. Farm visits and walks on others' farms allowed a discussion and sharing of local knowledge – such as the nature of a specific river and local environmental conditions – but allowed visiting farmers to be selective in how they revealed more personalised elements of this.

Whilst the previous extract highlighted the value of CSF activities being 'off-farm', the interviews also brought forward the importance of one's own farm space in the (co)construction and (re)working of knowledge relating to rivers and riparian environments:

> "Dad likes quick fixes and will want to know there and then, but I'm a long-term thinker and have the patience to wait, so a bit of both has been useful for running the farm – level each other out. [Emma: have you got any examples?]… well at first dad was set against planting by the river, and I said well it doesn't affect us so if it's all free for us I said go ahead and now, a few years later, it looks good and all the bushes/trees have filled out and dads quite happy with the job" (Farmer 9)
>
> "Me and my dad are very different, maybe because of the times I've been in farming, like more modern times I suppose, I think having his productive mindset and my maybe willingness to give back to nature has struck a good balance with how to run things. Like I want to look after the water, he wasn't as bothered, maybe because it was much later when he had to start thinking about it, whereas I've grown up with it." (Farmer 3)

Although arguably underplayed in previous research, perhaps due in large part to the methodological challenge of accessing people other than the principal farmers on farms (Riley, 2010), the extracts highlight how the micro-geographies and micro-politics of the farm help (re) shape knowledge (see also Wojcik et al., 2019). For our wider understanding, they illustrate that farming knowledge is neither entirely individualised nor static – continually being co-constructed and (re)negotiated between multiple people on the farm and thus evolving and changing over time. At one level, especially on family farms, this is generational, with differing cohorts of farmers exposed to different policies and technologies which shape how they view their farm practices – something evidenced in famer 3's reference to his greater acceptance of environmentally-sensitive practices being a result of 'having grown up with it'. At a second, and interrelated, level it was apparent that knowledge of particular parts of the farm – both particular habitats and particular practices – was not equal across all members, with some taking greater responsibility for certain parts of the farm and its practices. In the interview discussion that followed the extract of farmer 9 above, for example, the farmers had a disagreement about drainage on a particular area of their farm with his father, noting: "well you haven't been down there for ages, so I don't think your best to comment on that bit". Such examples of shared responsibility, and the evidence of how such responsibility may vary over time, highlight how farms are often a knowledge collective – with one person often not having full knowledge of all the parts of their farm, but relying on others to have greater knowledge of certain aspects. Whilst the example above considers family farming, others in the sample noted the importance of non-familial workers in this process. Several implications emerge from this for our broader consideration of farming knowledge. First, is that knowledge offered to farmers – such as that given from CSF events – is negotiated, reworked and assimilated within the crucible of the farm. This process involves a co-negotiation between several actors in deciding on the salience and credibility of this knowledge and its applicability to their farm. For the case of farmer 9, discussed in the extract above, this includes him translating the knowledge brought from a CSF event to his father and then an ensuing period of negotiation as they consider its relevance and the wider implications of applying it on their farms. Second, is that whilst we might see farming knowledge as cumulative – with the stock of knowledge increasingly layered and accumulated over time – the interviews revealed how the micro-geographies and micro-politics of the farm mean that these understandings are distributed rather than held by one individual. In turn, responsibility for particular parts of the farm – and the knowledges associated with it – may change and alternate over time, such as the older farmer passing responsibility for work around the river to his son.

6. Good environmental farming?

The previous two sections have highlighted the importance of various actors (including farmers, advisors and others occupying and

working on the farm) and spaces (particularly farm spaces and CSF events) in farmers' knowledge practices. Evident from this is that knowledge practices may vary in relation to different parts of the farm and may evolve and change over time. The following section considers the extent to which changing 'rules of the game' (after Bourdieu, 1990) can be noted within farmers' knowledge practices. The discussion of farm walks and farm visits, in particular, gave an insight into such potential changes:

> "You know, they were all saying how its altered how it looks, but that wasn't a complaint… they weren't being ecstatic about it but I think […] there is a little quiet pride, they will never bloody admit to it…but there is. Once they [a neighbour] had done it [conservation work on river bank], once we'd done a little bit on ours and they'd seen bits done… folk can see then because you are an advert then for how it works. And then other people were thinking… and then some have done the same after looking at it" (Farmer 10).
> "Like sometimes you may be interested in doing something [to improve the environmental performance of the farm], but just need a little bit more, you know, want to check it out before making the jump, so it's nice to have a look at what other people have done first, see how they have done it and make sure it's actually for us. It's true a picture is worth a thousand words" (Farmer 34).

The extracts highlight how visual interpretations and cues are important to how farmers consider and take on knowledge. Whilst many farmers talked about not being able to understand the finer (usually written) details on ecological and riparian environments and specific aspects of agri-environment schemes (or the 'know-why'), they highlighted that being able to visualise the result of particular conservation efforts – in this case the planting of trees around watercourses – gave an insight not only into what the 'outcome' of these measures would be, but also into how this would work in their particular context. Moreover, such examples suggest that the visual cues that have historically been used to assess someone's status as a good farmer – which might include the tidiness of their farms or how straight their crop planting lines are (Burton, 2004; Burton et al., 2008) – might also be starting to emerge for more environmentally-orientated efforts. The references to 'being an advert' and a 'little quiet pride' illustrate how such environmentally-orientated practices may too be seen as capital generating. What is important to note, here, is that these symbols which might be thought of as 'good environmental farming' were not seen to replace the pre-existing notions of good farming (that are often associated with production), but usually sit alongside them. The farmer observed by farmer 34, for example, was one who already had high levels of capital in the form of a long family history of farming in the region and a large farm and high-value livestock (objectified cultural capital). As Bourdieu (1996, p. 262) observes, "it is people who are richest in economic capital, cultural capital and social capital who are the first to head for new positions" and such pre-existing social relations were important to how farmers took on and utilised the knowledge they offered on CSF. As Silgo and Massey (2007) observe, the risks of entering into new practices may be reduced when the knowledge about these practices come from a trusted source. For farmer 34, there was already a level of thick trust for the observed farmer as a result of his reputation and pre-existing level of good farmer capital. The farm walk allowed the addition of a level of process-based trust – not simply from speaking directly to the farmer, but also by being able to visualise their conservation work in context. As Zucker (1986, p. 60) notes, this process-based trust is premised on individuals being able to see that others will act in "broadly predictable ways" and whilst they suggest this is usually developed through the collection of "considerable amount(s) of person-specific information" through recurring exchanges, the interviews about farm visits highlight how the farm became a proxy in the absence of a history of such recurring exchanges between the farmers. Observations of the wider farm – including its size, its buildings, its machinery and the practices on it – were used by visiting farmers to assess the history of the farm and calculate the capital and good farmer status of the host farmer. This in turn offered a level of trust of the farmer and hence increased the credibility of their knowledge and offered a reassurance that CSF practices become part of, rather than detract from, their good farmer status.

A more overt example of how farmers' knowledge practices have altered was in relation to the changing structural conditions of agriculture – relating both to evolving agricultural policy and also perceived changes in the weather:

> "Like the weather is getting worse really so it's a lot wetter, so for things like that, it's changing now so I'll happily take advice from [the advisors] on what we can do…yeah it was a problem but now it's getting a lot worse so the best thing we can do is use these people and their knowledge, as its only going to get worse [the wet weather] and water can cut the farm size in half sometimes. (Farmer 13).
> "At the time it was all introduced and we were all against it, everyone wanted to keep farming and doing what they were doing, what has happened, the climate has got wetter and wetter, and [a neighbour] did some work and then we discussed it at meetings and like over the farm gate and with [advisor] and had a good think about it and now everyone is kind of on board with it all" (Farmer 23).

In both cases, changing weather patterns were suggested as altering knowledge practices as they present farmers with a level of risk and uncertainty. Siegrist and Cvetkovich (2000) note that social trust becomes important when individuals have relatively little knowledge of a perceived risk, and it can be seen that advisors' and other farmers' knowledge gains greater salience in light of the new risks presented by changing weather patterns. As Bourdieu (1990) notes, although actions tend to be reproductive rather than transformative when the rules of the game remain constant, there is potential for habitus "constantly perform adaptation(s) to the outside world" (Bourdieu, 1993, p. 78) – particularly in relation to crisis events. The changing weather, and its association with the increased severity and frequency of flooding recently observed by these farmers, arguably serve to alter the rules of the game that farmers operate within and, accordingly, reshape the variety of knowledges they draw upon and the credibility and salience of these other sources.

A final area relating to the importance of temporality within farmers' knowledge practices pertained to how, through longer-term engagement, farmers have developed their own knowledge of environmentally-sensitive practices:

> "They say we need to stop soil erosion, so this is some more of the conifer roots or whatever and a few…you shove the trunk of the tree into the bank and leave the roots hanging out in the water. Yeah, it's definitely doing its job and stopping the erosion." (Farmer 3)
> Interviewer: Was this suggested by anyone?
> "I just made this up myself, and it's doing a good job, quite proud of myself really! I know a few others are doing bits like me now […] I was telling [a neighbour] at the meeting the other day about it and they are going to give it a try" (Farmer 3)

Oreszczyn et al. (2010) have referred to how problem solving is a large part of informal knowledge creation, and the examples given here illustrate how farmers' pre-existing skills in this area may be harnessed. Seeing attempts of other farmers – including tree planting and the use of reinforcing posts – to reduce soil erosion, the farmer illustrated practical know-how and skill in developing this localised solution. Here, they recognised the general objective of CSF – as put forward by advisors and shared in CSF meetings – but are able to utilise experiential and practical knowledge on their farms in developing a type of hybrid knowledge which provides a context-specific solution.

7. Conclusions

This paper has utilised the Catchment Sensitive Farming initiative to examine farmer knowledge(s) and knowledge practices and the potential of group settings in (re)shaping these. Through a consideration of good farming and farming capitals, the paper has seen that social relations, both past and present, are crucial to how knowledge is developed and shared. An overarching observation of the paper is that the dialogue and knowledge exchange between farmers and advisors is a positive one in the context of CSF and two specific findings can be pinpointed for this. First, is that previously observed farmer-advisor knowledge contestations have tended to focus on specific environments and practices commonly holding production value and standing as clear testament to farming skill (cultural capital) whilst rivers and riparian environments, the paper has shown, stand less clearly as markers of good farming and have less competitive value thus making it more suitable for sharing. When this is coupled with the rapidly changing regulatory environment, farmers are receptive to the know-how and know-who that advisors may offer, and advisor knowledge has become increasingly salient. Second, is that in the same way that farmers may accumulate capital, and hence status, amongst their farming community, so too can advisors. The paper has seen that this can be achieved through each, or a mix of, extended periods of engagement between farmers and advisors; an advisors' own farming biography; and, significantly, advisors demonstrating contextualised knowledge – relating both to the specific locality and the relevance of advice to each specific farm. This contextualisation was seen to greatly enhance the credibility and legitimacy of advisors' understandings and was achieved by tailoring knowledge to fit the particular contexts of the field – what we have referred to as *geographical* articulation, within which advisors presented information directly related to the specific landscapes and farmscapes and hence increased the credibility of their knowledge. A practical recommendation flowing from this for those wishing to engage farmers in environmentally-sensitive practices is to play close attention to local contexts – not only relating to specific structural issues of the farm operation or the climatic conditions of the locality, but also the local cultural milieu within which farmers operate.

Whilst earlier calls have been made to move beyond the dichotomous labelling of knowledge as either expert or lay, our findings here extend this call in suggesting a move beyond the reifying label of 'farmer knowledge'. First, although recent research has recognised that farmers develop hybrid knowledge which synthesises both scientific and more experiential understandings, we have noted that such knowledge practices may vary significantly in relation to different parts (habitats and practices) of their farms. Second, and interrelated, we note that the farm is often a knowledge collective, with seldom only one person having full knowledge, or management responsibility, for all of the farm and also observing that this may (inter)change over time. Such observations are not only conceptually important, but may inform how we seek to share knowledge on new practices and policies, with less resistance observed to taking on new knowledge in relation to rivers and riparian environments and a need to seek to engage whole farm groups rather than just individuals.

Our findings highlight the importance of place and spatial contexts (both material and social) to knowledge sharing practices. Practically, our findings reaffirm the value of CSF farm visits, walks and group meetings. These spaces are not simply containers for action, but have social meaning and are value-laden. They allow important contextualisation for farmers – both of how CSF activities play out in a familiar environment and in allowing an assessment of whether those farmers practicing CSF-related activities are ones to be trusted and emulated and where the credibility of knowledge may be enhanced. Alongside this, being off-farm afforded farmers a less intimidating space where they could share knowledge selectively and personal information could be filtered out as they felt appropriate. Our evidence suggests CSF's current use of collective meetings and farms for observations are successful in providing a forum for communication and we would use our observations here to encourage the careful future selection of these case study farms. In addition to how successfully these farms implement CSF activities, organisers should also take note of the pre-existing reputation of the farm(ers) as this may allow trust to be more rapidly developed and others to more readily follow their example.

Finally, our paper has highlighted the possibility that changing rules of the game may be reworking farmers' knowledge practices and reframing what (and how) knowledges are seen as legitimate. Changing weather patterns and shifting regulations are seeing an increased porosity of farmers' knowledge boundaries and increasing their receptiveness to, and reliance on, others' knowledge. Important to note, though, is this current hybridisation of knowledge on farms remains influenced by past history. Whilst it was apparent that symbols of good farming were starting to emerge in relation to conservation and CSF activities, these were strongly interlaced with, rather than replacing, more conventional symbols of good farming. Future work could usefully seek to monitor whether longer-term engagement with initiatives such as CSF might see more widespread evidence of farmers' knowledge sharing, the innovative solutions that they might develop to environmental questions, and the associated legitimacy they give to off-farm knowledges.

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